MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

ECE3076 – DATABASE SYSTEMS

(All Section / Groups)

07 MARCH 2017
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTION TO STUDENTS

1. This examination paper consists of five (5) printed pages including cover page containing four (4) questions only.

2. Answer all questions. All questions carry equal marks (25 marks each) and the distribution of marks for each sub-question is given. The total for this paper is 100 marks.

3. Please write all your answers in the Answer Booklet provided.

Question 1

You are given a database system that tracks the production queue for a small factory. Primary keys for each table are in **bold** and underlined.

```
Queue      (Q_ID, Prod_ID, Op_ID, D_Created, D_Completed)
Product    (Prod_ID, Prod_Name)
Operator   (Op_ID, Operator_Name, Date_Joined, Position)
Pay        (Op_ID, D_Start, D_End, Total_Pay)
```

Notes:

- `Q_ID`, `Prod_ID` and `Op_ID` are auto-incrementing `INT(10)`.
- `Prod_Name`, `Operator_Name` and `Position` are `VARCHAR(255)`.
- `Total_Pay` is type `Decimal(5,2)`
- `D_Created`, `D_Completed`, `D_Start` and `D_End` are type `Date`.

a) Write an SQL command to create the table `Queue` with proper foreign key references, where deletions from the `Product` table should be set to cascade and deletions from the `Operator` table should be set to null.

[9 marks]

b) Write an SQL command to add the `VARCHAR(255)` field `Prod_Desc` and the `Decimal(5,2)` field `Price` into the `Product` table.

[3 marks]

c) Write an SQL command to insert the following new operator:

ID	Name	Date Joined	Position
132	Louis Chan	16 January 2017	Regular

[Hint: The format for date is yyyy-mm-dd]

[3 marks]

d) Write an SQL to create a view called `OpScore2016` that displays the `Op_ID`, `Operator_Name` and the count of products in the queue grouped by operators that were created after 1 January 2016 and completed before 31 December 2016. Order the operator names in alphabetical order.
[Hint: The format for date is yyyy-mm-dd]

[5 marks]

e) A new operator is always assigned to create product with id 100. Create a trigger `op_init` such that upon the insertion of a new operator in `operator` table, a new queue item with the corresponding `Op_ID` and `Prod_ID` will be set inserted.
[Hint: You may either use `CURDATE()` or `Date_Joined` of the operator for `D_Created`. `D_Completed` should be left as NULL]

[5 marks]

Continued...

Question 2

Pizza Palace is implementing their pizza delivery system to use a modern database. You are tasked as the database designer to create a proper database model for their pizza parlor. The following are their business rules:

- A customer needs to make at least one order to be recorded in the system. He can make many subsequent orders after that.
- An order can consist of up to 20 items from the menu, but needs at least one item. A menu item can be listed in many orders also, including none if not ordered before.
- A chef is assigned to assemble an order as soon as he starts his job. He prepares many orders in his career. An order also requires several chefs to assemble with a minimum of one.
- Once completed, the order is sent by a delivery person to the customer's address. However, he may not be assigned an order yet the moment he registers for his job. He will send many orders throughout his career.
- Chefs and delivery persons can be generalized as staff, although their jobs do not overlap. [Hint: use Extended ERD for this]

a) Draw an ER diagram to represent the conceptual model for the database based on the rules above. At the conceptual model, M:N relationships are left unresolved. You must indicate all possible connectivity and cardinality information in your diagram.

[19 marks]

b) Identify any M:N relationships from Question 2a) and then resolve them by drawing an ER diagram for each resolved relationship. Remember to indicate all connectivity and cardinality information in the diagrams.

[6 marks]

Continued...

Question 3

a) You are given the following `Relation A` with the primary keys underlined.
`Relation A(Col1,Col2,Col3,Col4,Col5,Col6,Col7)`

You also given the following functional dependency information indicated by->
[Example: `ColX->ColY` indicates that `ColY`'s values are determined by `ColX`.]
`Col1->Col2, Col3->Col4, Col7->Col6, Col1,Col3->Col5,Col7`

i) Draw the dependency diagram for `Relation A` with the corresponding partial and transitive dependencies correctly labeled.
[6 mark]

ii) How can we determine if `Relation A` is in first normal form (1NF)?
[2 marks]

iii) What are the requirements for a relation to achieve second normal form (2NF)?
[2 marks]

iv) What are the requirements for a relation to achieve third normal form (3NF)?
[2 marks]

v) Show the steps to normalize `Relation A` directly to 3NF (You can skip 2NF). Use the alphabetical order for names of the new relations created by this step.
[5 marks]

b) You are given a schema for two entities below, where Parent and Child are related by the foreign key Parent_ID in the Child relation in a 1:M relationship:
`Parent(Parent_ID,Parent_Name)`
`Child(Child_ID,Child_Name,Parent_ID)`

i) Explain how the entities above respect the entity integrity requirement.
[2 marks]

ii) Represent BOTH entities using TWO TABLES with FOUR SAMPLE RECORDS EACH in a way that fulfills the entity integrity requirement, but VIOLATES the referential integrity requirement.
[6 marks]

Continued...

Question 4

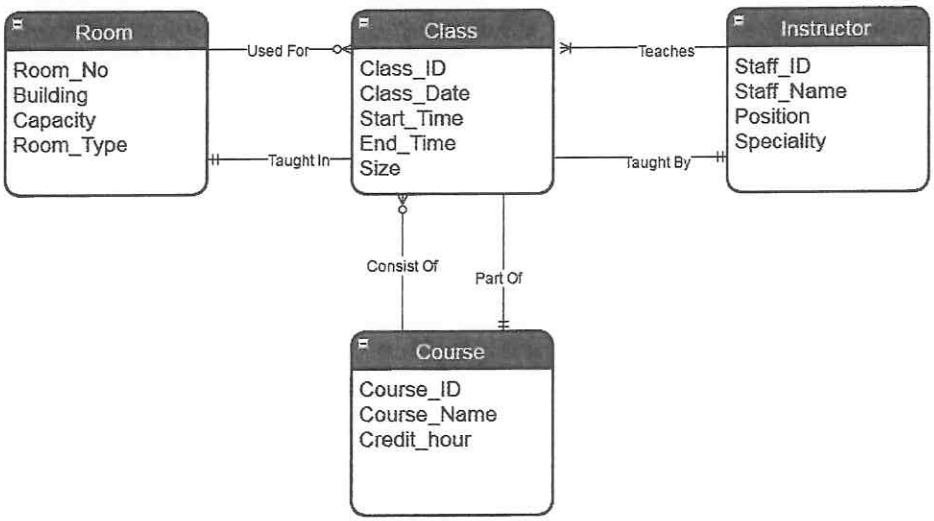
a) The following table depicts a scenario with several transactions from different users and the data items locked and required by each transaction.

Transaction	Data Items Locked	Data Items Required
T1	X11,X14	X7
T2	X4,X5,X6	X2,X7,X10
T3	X2,X10,X16	X7
T4	X1,X8	X2,X7,X16
T5	X7	-
T6	X3,X15,X18	X7
T7	X9,X12,X13	X7,X17
T8	X17	X7,X14

Draw a wait-for graph. Indicate the transactions that are causing the deadlock if any.

[5 marks]

b) Convert the following Crow's Foot ERD into its object oriented UML equivalent representation.



[16 marks]

c) In the wound-wait scheme, an older transaction rolls back a younger transaction and reschedules it using the same timestamp whereas a younger transaction will wait for the resources to be released. Given the following scenario where T1 holds resources X1, X2 while T2 holds resources X3 and X4. T1 needs X4 to complete while T2 needs X1 to complete. Assuming T1 is the older transaction and makes the request first for X4, describe in 4 steps how the above scenario is resolved using the wound-wait scheme.

[4 marks]

End of paper